CLAIM AMENDMENTS

Please add new claims 83-85.

1. (Original) A method for sensing a sample employing a profiler, said profiler having a stylus sensor assembly with an arm rotatable about a pivot and a controller controlling a force acting on the arm, said method comprising the steps of:

(a) positioning a sensing tip above one location of the sample;

(b) reducing a distance between the sample and a sensing tip without substantially moving the tip and the sample laterally relative to each other and without substantially rotating the arm about said pivot, until the tip touches the sample;

(c) measuring data related to a height of the sample surface with the tip stationary and in contact with the sample;

(d) increasing a distance between the tip and the sample to lift the tip off the sample;

(e) causing lateral relative motion between the sensing tip and the sample and positioning the tip so that the tip is above a location of the sample adjacent to and spaced apart from said one location; and

(f) repeating steps (b) through (e) at a plurality of locations of the sample to obtain an image of the sample.

2-82. (Cancelled)

83. (New) An apparatus for sensing a sample, comprising:

an atomic force microscope assembly for sensing the sample, said assembly including a base portion and a movable portion, said movable portion including a sensing tip connected to the base portion, wherein a force applied to the tip caused by contact between the tip and the sample may cause the tip to move relative to the base portion;

one or more moving stages causing a vertical relative motion between the assembly and the sample, thereby changing a distance between the assembly and the sample; and

a measurement controller configured to measure the vertical relative motion between the assembly and the sample, and to compute a change in the distance between the sensing tip and the sample caused by a combination of the relative motion between the tip and the base portion of the sensor assembly and said vertical relative motion.

84. (New) An apparatus for sensing a high aspect ratio feature on a surface of a sample comprising:

a sensor assembly comprising a probe and at least a first and a second sensing tips on the common probe with known spatial relationship to each other, the second sensing tip comprising a nanotube;

a device scanning the first sensing tip across the surface with the first tip in contact with the surface until the feature is found; and

an instrument scanning the second sensing tip across the surface with the second tip in intermittent contact with the surface to measure the feature.

85. (New) The apparatus of claim 84, said nanotube extending beyond the first sensing tip.

SPECIFICATION AMENDMENTS

Page 1, line 5, "CROSS REFERENCE TO RELATED APPLICATIONS," please amend the paragraph as follows:

CROSS REFERENCE TO RELATED APPLICATIONS

This application is a continuation of application Serial No. 10/330,901, filed December 26, 2002, now abandoned, which is a continuation of application Serial No. 09/313,962, filed May 18, 1999, now U.S. Patent No. 6,520,005, which is a continuation-in-part of application Serial No. 08/730,641, filed October 11, 1996, now U.S. Patent No. 5,948,972, which is a continuation-in-part of application Serial No. 08/598,848, filed February 9, 1996, now abandoned, which is a continuation-in-part of application Serial No. 08/362,818, filed December 22, 1994, now U.S. Patent No. 5,705,741. ~~This application also claims the benefit of application Serial No. 08/362,818, filed December 22, 1994.~~

On page 11, please amend the paragraph on lines 3-20 to read as follows:

Fig. 3 is a schematic view of a scan path of the stylus tip 20 of Fig. 2A for finding and measuring a feature in the surface to illustrate one embodiment of the invention. Thus, stylus sensor assembly 10 is positioned so that stylus 20 is at position 72 above a location 74 of the sample surface 40. Stylus 20 is then lowered by means of Z stage 62 by lowering the entire stylus sensor assembly until it is determined that stylus 20 touches or is in contact with surface 40 at location 74. Stylus 20 is then raised, again by means of Z stage 62 by raising the entire stylus sensor assembly 10 until the stylus 20 is again at the starting point 72. The XY stage 64 then causes lateral relative motion between the sample surface and the stylus 20, by moving the stylus sensor assembly 10 and the Z stage 62 along the X direction by a predetermined step size dx to point 76 which is above another location 78 of the sample surface 40, where location 78 is spaced apart from but adjacent to location 74. The Z stage 62 is again used to lower stylus 20 by lowering the stylus sensor assembly 10 until it is determined that stylus 20 is in contact with the

surface 40 at location 78. Stylus 20 (and the stylus sensor assembly) is then raised by means of Z stage 62 back to point 76 and lateral relative motion between the sample surface and stylus 20 is again caused by XY stage 64. The lateral motion dx may be in a range of about ~~1~~one nm to ~~50~~fifty mm.

On page 15, please amend the paragraph on lines 12-24 to read as follows:

In order to avoid having to raise the stylus by distances much larger than the actual height variations of the sample surface, it will be useful to have some prior knowledge of the height distribution of the sample surface (e.g. within a target area) before scanning starts. For example, if the portion or point of the highest elevation of the sample surface is known, the stylus 20 ~~or 20'~~ may be positioned at a point directly above or close to such highest point or portion before scanning starts. Then such starting point and the distance by which the tip is subsequently raised above the prior point of contact with the sample surface can be much reduced. In one embodiment, such distance can be in a range of about 100 to 500 nanometers. Then the above-described procedure in reference to Fig. 3 may be carried out without the risk of the stylus coming into lateral contact with a side wall of the sample surface, where Z2 can be reduced to the sum of the expected feature depth and a shorter distance such as one in a range of about 100 to 500 nanometers.

On pages 15 and 16, please amend the paragraph from line 25 on page 15 to line 17 on page 16 to read as follows:

When prior knowledge of the sample surface 40 is not available before scanning starts, it may be a simple and fast procedure to obtain such height distribution information by carrying out the process as illustrated in Fig. 3, with Z2 at a large value, but only at a few sampling locations of surface 40, such as ~~3~~three to ~~25~~twenty-five locations. Since the heights of only a few locations of the sample surface 40 are measured, this process will not take an inordinate amount of time even when a large value of Z2 is used. Typically, the user is able to position the stylus sensor assembly

over the general area of a feature of interest, such as at a point that is above a surface location within about 1 or 2 microns from the feature of interest. Therefore, a target area of several microns by several microns (e.g. 2 by 2 microns) may be defined, and the several sampling locations chosen within the target area. The above-described process in reference to Fig. 3 may be carried out only at such locations in such small target area to find out the height distribution over such area. After the height distribution of the target area is known, then the stylus may be positioned at a point which is above a portion of the sample surface which is at or close to the point of highest elevation in the distribution. It should be noted that, even if the stylus is not placed immediately above the point of the highest elevation of the target area, as long as the distance by which the stylus is raised after contacting such point causes the stylus to be higher in elevation than any portion of the sample surface within the target area, the stylus will not come into lateral contact with any portion of the sample surface to damage the stylus in the subsequent lateral relative motion between the tip and the surface. This allows the user a higher tolerance in positioning the tip.

DRAWING AMENDMENTS

The office action objected to the drawings in that reference numeral -- 20' – suggested by the specification on page 15, line 16 does not appear in the drawing figures. The specification has been amended to delete reference numeral 20'. No amendment to the drawings is required.